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B03C 3/48.

Patent Application

Commissioner of Japan Patent Office:  
1. Title of the Invention: Air sterilization and purification apparatus  
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    Domicile: Kiyoshi ANZAI  
3. Applicant: Director: Kiyoshi ANZAI  
    Domicile: Kyowa Seiko, Ltd.  
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5. List of Appended Documents Marukin Building, Kagurazaka, Shinjuku-ku Tokyo 162  
    (1) Specification 1 set  
    (2) Drawings 1 set  
    (3) Duplicate Copy of Application 1 set  
    (4) Power of Attorney 1 set Method Examination  
    (5) Request for Examination 1 set

[illegible stamp]

Specification

1. Name of the Invention: Air Sterilization and Purification Apparatus

2. Scope of Patent Claims

In an air purification apparatus that passes positively charged airborne dust between opposing electrodes, an air sterilization and purification apparatus wherein air is caused to pass through while inducing a separation phenomenon by switching the direction of flow of air that passes through the aforementioned opposing electrodes and modifying a cross section of the passage.

### 3. Detailed Description of the Invention

The invention of the present application is one that relates to an air sterilization and purification apparatus, and in a purification device that causes airborne dust particles to be absorbed by static electricity, relates to a device capable of raising dust removal effectiveness, and is intended to achieve an air sterilization and purification apparatus that, in particular, is made up of a combination of novel and ever simpler elements, is manufactured by a simple process with lower costs of production, and that, with excellent safety, is capable of achieving even better results in use.

Along with the development of heavy industry, air pollution from sources at each stage of the production process, nitrous oxide and sulfur dioxide emitted from transportation sources, and heavy metal particulates, have steadily increased. The widespread expansion of pollution has become an issue of serious concern to society, and various regulations have been proposed to prevent pollution, including preventing the generation of toxic materials as well as the strengthening of emissions standards. These approaches, however, cannot be considered adequate, and there are a growing number of people who suffer from lung cancer and other cancers as well as an increase in the number of people suffering from asthma. Air purifiers have become a common and indispensable part of life and are to be found installed in homes and sickrooms to prevent and/or treat these illnesses, and are used as prevention or treatment devices in the production stages of sanitary pharmaceuticals, foods, devices, and are also employed in the production of precision machinery.

A variety of devices have been suggested to cleanse the air by removing airborne toxic materials. Among those are air purifiers that use filter materials in air flow passageways to physically collect the dust, or electrical air purification devices such as dust removers that make use of static electricity or infrared rays to disinfect the air, or a combination of any of these approaches in order to remove toxic materials.

Among these, suggestions for conventional devices based on the aforementioned use of static electricity are known, including, for example, (a) an approach utilizing centrifugal force designed such that air, induced from an air inlet, passes through an ionization element while electrical voltage is applied to the inner and outer cylinders while the inner cylinder rotates, moving the air between the inner and outer cylinders, and (b) an approach where, in the above configuration, the outer circumference of an inner cylinder has inclined guide vanes provided in the axial direction along the outer circumference of the inner cylinder and rotational movement is applied to the air as it passes through between the inner and outer cylinders to make use of centrifugal force.

The above mentioned approaches have attempted combined dust collection by the use of electrostatic migration and centrifugal force, however, because high voltages with 11 KV in between the inner and outer cylinders, and as a result of rotating the induced air, a rectified electricity may be generated due to frictional resistance depending upon the air flow rate, and electric discharge sparks may occur between the dust particles that have collected onto the external cylinder, frequently causing risk of electrocution as well as the increased production of ozone and possible malfunction of the device.

In view of the above, research conducted by the inventors of the present application have overcome and eliminated the well known defects described above, and have perfected a device that is superior in terms of safety and that markedly increases the efficiency with which dust is adsorbed. The invention comprises a fan motor; an inner cylindrical electrode that has a

built-in high-voltage transformer, and that is connected to the positive side; a high voltage cap connected to the negative side; an external cylindrical electrode that is earthed; and a housing that has openings on both sides, and that is supported by a pedestal. On occasion that airborne dust that is guided into the unit through the upper inlet passes through an ionization section high-voltage cap that is connected on the negative side, a positive charge is applied to the dust, and it is guided into the electrostatic field between the grounded outer cylindrical electrode and the positive inner cylindrical electrode, and as a result of the electrostatic induction effect, airborne dust passing through is adsorbed onto the surface of the outer cylindrical electrode. Thus, the present invention is characterized by having opposing electrodes that have a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed curved surfaces on the inner cylinder and an outer cylinder provided with a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed surfaces, wherein the convex curved surfaces or recessed surfaces of the inner cylinder and the convex surfaces or recessed surfaces of the outer cylinder alternate with each other. By creating an electrostatic field between these opposing cylinders, the direction of the flow of air passing through them can be altered, and the flow passageway cross section can be altered so that the flow rate fluctuates, thereby creating a flow separation phenomenon. This causes the generation of a stagnant flow, a reverse flow, or a turbulent flow of air that contains dust. The intention here is to extend the duration of the effect of the electrostatic adsorption on the outer cylindrical electrode surface and to increase in the efficiency of dust removal. The next object of this invention is to provide a device with superior safety. Additionally, an object of the invention is to provide a simple and compact mechanism that can be made available at low cost and that can be placed easily in a variety of locations, as well as to provide a device that allows simple, easy, and safe cleaning of the panel upon which the dust has been adsorbed. Other objects and characteristics of the present invention can be understood from the following explanation.

In Figs. 1 through 5, a housing acceptor cylinder (5) is supported on a stand (1) by means of a shaft (2) upon which a support board (4) consisting of insulating material and provided with exhaust windows (3); an external cylinder accepting cylinder (7) is mounted on the edge of the lower opening section of said housing; an exhaust windows (6') is arranged in the external cylinder barrel (7); and a fan motor (8) is internally installed in a motor cap (9). The fan motor (8) (for practical purposes, preferably with a maximum torque of  $1040 \pm 10\%$ ) is connected to a power source, and the motor cap (9) has a built-in high-voltage transformer (11) that is connected to a power source. An inner tube electrode (14) made of metal and provided with stepwise alternating vertical curved surfaces (12) and convex curved surfaces (13) is installed onto the positive side of the high-voltage transformer, and a rounded-head inner cap (16) made of insulating material and continuing the multiple outer cylinder support [illegible] (15), (15) is mounted in the top opening of this inner cylindrical electrode (14). A metallic high voltage cap (18) that is provided with a limit switch (17) is installed in this cap (16) and connected to the negative side of the high-voltage transformer and a metallic outer cylindrical electrode (22) provided with stepwise alternating vertical curved surfaces (20) and recessed curved surfaces (21) on the upper opening edge step section (19) of the outer cylinder acceptor (7). The vertical arced surfaces (20) and the recessed arced surfaces (21) are positioned so as to face the swelling arced surfaces (12) on the inner cylindrical electrode (14) and the vertical arced surfaces (12) on the inner cylindrical electrode (14) with each other, respectively. The external cylindrical electrode (22) faces the inner cylindrical electrode (14). According to FIG. 1, an air inlet window (23) is arranged in the upper opening of the external cylindrical electrode (22), and a retainer plate (25) made of insulating material is provided on the bottom limit switch retainer element (24). Next,

the housing (27) is installed on the upper opening of the outer perimeter section (26) of the housing acceptor cylinder (5), which is installed on the support board (4). A head section retaining cylinder (28) is installed at the top section of this opening, and an air inlet window (29) is provided in this upper opening and a connector board (31) made of insulating material and provided with dust-proof mesh/screen (30) that is connected by means of bolts (32) to the retainer plate (25), air inlet windows (29), and air inlet windows (23), and is configured so that air passes between the inner and outer electrodes, the exhaust windows (6), and the exhaust windows (3), and is circulated to the outside when the fan motor (8) is operating.

At this time, when the high voltage transformer (11) and power source are connected by a switch, which is separately arranged (in practical terms, an input voltage of 100 V AC and output voltage of 7 KV DC are preferable) the airborne dust that is introduced [into the unit] is positively charged in the vicinity of the transformer (11), by the inner cylindrical electrode (14) that has been connected to the positive side by means of the electrostatic induction between the inner and outer electrodes, and is migrated to the external cylindrical electrodes (22) and clung to its walls.

Here, the direction of the air flow that is passing through the convex curved surfaces (12) and vertical curved surfaces (13) provided on the inner cylindrical electrode (14) is switched by the vertical curved surfaces (20) and recessed curved surfaces (21) provided on the outer cylindrical electrodes (22), and as a result of the change in the cross section layer between these electrodes, the spacing between the vertical curved surfaces (12), (20) of both electrodes should be approximately 20 mm; the spacing between the vertical curved surfaces (21) on the outer cylindrical electrodes (22) and the convex surfaces (13) on the inner cylindrical electrodes (14) should be approximately 16 mm; and the spacing between the recessed curved surfaces (21) on the outer cylindrical electrodes (22) and the vertical curved surfaces (12) on the inner cylindrical electrode (14) should be approximately 25 mm, for practical purposes. The recessed curved surfaces (21) should be 5 mm in diameter, while the convex curved surfaces (13) should be 4 mm in diameter. There is a change in flow rate, and the separation phenomenon is augmented. As a result, the dust-bearing air flow stagnates, reverses or becomes turbulent, thereby extending the duration for electrostatic adsorption and increasing dust collection efficiency (Fig. 6).

In the cross sectional configuration of the above mentioned both electrodes described above, in another embodiment, the convex curved surfaces (13) of the inner cylindrical electrodes (14) could have a gentle linear flow [illegible] convex curved surfaces (13) on the upstream side to intensify the switching of the direction of flow and the change in the flow passageway cross section, making it that much easier for the separation phenomenon to occur, forming lead (33) between the convex curved surfaces (13), (13) for a configuration that augments electrostatic induction. (Fig. 7)

Moreover, as a separate embodiment, convex curved surfaces (34) with gentle flow lines are formed on the upstream side of the outer cylindrical electrodes (22), and both flow line convex curved surfaces (34) and flow line convex curved surfaces (35) are positioned so they oppose one another, thereby intensifying the switching of the direction of flow and the change in the flow passageway cross section, extending the duration in which adsorption occurs due to stagnation, reverse flow, and turbulent flow of the dust-containing air (Fig. 8).

With regard to removal of dust clung onto the surfaces of the outer cylindrical electrodes, the power to electrode (22) is removed along with the retainer plate (25) by removing the connector board (31) and by pulling up and removing the head section retaining cylinder (28) and the housing (27), and after cleaning these, it is easy to restore them to their original state and join together. At this time, the retainer element (24) of the retainer plate (25) is separated from the limit switch

(17), thereby breaking off the flow of current between the high-voltage transformer (11) and the power source, so that there is no risk of electrocution.

As configured above, the present invention extends the duration of the cling effect on the outer cylindrical electrode by means of electrostatic induction of the dust-carrying air that passes between the electrodes, thereby increasing the efficiency of dust removal and reducing mold spores and yeast fungus.

Moreover, this is a particularly safe device since there is no danger that frictional force and resulting rectified electricity will be generated as a result of centrifugal force as the air passes through the unit, and the risk of malfunction due to sparking electric discharge between the adsorbed dust particles resulting in electrocution or explosion can be prevented, and the generation of ozone can be suppressed.

Also, given the device's simple and compact configuration, it can be manufactured less expensively, and it is also easy to move.

#### 4. Brief Description of the Drawings

Figure 1 is a front view. Figure 2 is a plan view. Figure 3 is a view of the bottom surface. Figure 4 is a cross-sectional view along the A-A line in Figure 1. Figure 5 is a cross-sectional view along the B-B line in Figure 1. Figure 6 is an enlarged view of the area indicated by the letter E in Figure 4. Figure 7 is an enlarged flow line cross section diagram of another embodiment. Figure 8 is an enlarged flow line cross section diagram of yet another embodiment.

Applicant: Kyowa Seiko, Ltd.

Agent: Hiraki MIURA [seal]

(4)

## 特許願

昭和五十年八月六日  
 1. 発明の名称 空気吸出装置  
 2. 国籍 営業所  
 3. 特許申請人  
 4. 代理人  
 5. 送付実施の日数  
 (1) 男根青 1週  
 (2) 四面 2週  
 (3) 顕微鏡 1週  
 (4) 職任社 1週  
 (5) 天使口 等 2週

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④日本特許庁  
公開特許公報

①特開昭 51-90076  
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 ③特許権 F.O. 16080  
 ④出願日 昭50(1975) 2. 6  
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厅内整理番号

7033 1/1

④日本分類

72 C14

④IPC国別  
B03C 1/00

本発明は、大口径の空気吸引装置を主として、  
 特にそれが複数の吸出部とて構成された場合に  
 その各吸出部の吸出量の強度をコントロールす  
 る。すなはして吸出部をより広く擴張開拓をして  
 大きく取り上げたり、又はその吸出部について  
 積極的に拡張開拓され、有効な量の吸出の  
 手段として利用する方法が本発明である。本大  
 きくとはいえず、又は手動による操作等その他の方  
 法で又はせんそくして擴張開拓の方法である。即  
 ち操作部には、上面開口の手筋上又は側面上に設  
 けた目盛り板前面上に位置し、子房、力巻筒等  
 として用い又は取扱い易く、又は、ばね等の機  
 械式においてても可とし、操作部の操作範囲内  
 にて手及し、操作上不虞の誤操作を防ぐ。

セミヤ、エヌヤの空気吸引装置を専門として持つたの  
 大きな会社又は個人が運営され、セミヤは空気  
 の過濾等について得意とし、エヌヤは用い当該の  
 に適応するものよりはるかに効率的かつより又は安  
 価なもの又は操作性を重視する場合を除くナエ  
 ナイ化的に行き手が少く利便その點に優れると見ら

## 特許請求の範囲

1. 発明の名称 空気吸出装置  
 2. 特許請求の範囲  
 3. 本発明をなされたる空気吸引装置は、力  
 工子又は吸出部を通過せしむるようにしてした空気吸引  
 装置において、上述の内側に吸出部を通過する空気  
 の流れ方向を逆流させ、本口側面の吸出部を逆流  
 せしむことによって、吸出部を逆流せしめること  
 を可能とししむるようとしたことを特徴とする空  
 気吸引装置。

## 3. 発明の詳細な説明

本発明は、空気吸引装置を対象にし、又は、  
 そのふんじんを対象にとり扱う装置を  
 使われて、その操作方法を併せて記すこととする  
 が、本発明は、とくに同様の一用具等を操作する  
 からなり。同半々工具とよき扱い空気吸引装置を  
 用いる。工具は機械的機械的工具を含むとする  
 ものである。

本発明の特徴は、空気吸引装置において

合せ部分によって互いに力を失せんとする傾向が示されている。

上口の火事は、普通火口の吸引力と火口力との合  
成算定在用を施つたものであるが、此火口外火口  
門にエスカーラ火口外火口を設し、火入火口外火口  
をもつて、火口の火況によつては所用火口外火口エ  
つて是れ火口を生じ、火口外火口されえ上んじん  
七の間に火口外火口を生じ、しばしばは火口の火を  
がる。又オランダ火口外火口を火口外火口と外  
め火口外火口しくとも、又しばしば火口外火口を生ずる  
火口外火口をもつたので西日本が田舎でもつた

にして、内田はおおでせ大野と伊藤を取回すことに  
に立って、内田はその段の成り方の仕事よりは  
成程新興書の文化政策を推進せし結果だ。それの  
對外報文で見て下さい。これがエコノミー書院  
のあれの年、成程新興は内田の仕事です。内  
田は新興の書院が如何に運営すればよし、新興  
が何をやることでよいか等を研究するなりで  
す。不思議の本の印行は、成程新興が始めた本社を  
出しますとよくなり、電子機器開発の本の印行は、  
成程新興がで本を化さず、成程新興がするところ  
であります。成程の出版に如何な目次でかづかん人の  
範囲をかんがえ天皇が御用紙を成程新興がかづかん人  
の御用紙をかづかん人であります。不思議のその他の目的  
成程新興はその範囲をかづかん人であります。

“蒙古族人民对毛主席的敬爱之情是与日俱增，  
这是一点一滴地流露出来的。”

江主の口に聞いて、女房の口と少輔の口を合して、  
て是れが高麗國の事は其處の國の事かからぬる  
其處の國は、ハラシナツ支那の女房なり。故ヘア

ପ୍ରକାଶକୀ—ଗଣେଶ୍ୟାମ

その日、おじいちゃんがお出でにならぬ時は、入る  
事なく、おじいちゃんがお出でな時は、入る  
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事なく、おじいちゃんがお出でな時は、入る  
事ある。

これら又、別の実験として、大根葉菜(即ち)  
- お徳利において既生を用ひて日露西(60)を或ひ  
- 関東葉菜(下良田)において既生を用ひて日露西(60)  
を或ひ、而して葉菜(日露西(60))を更に  
化粧をもして供給せし。此の方法が最も、此の時  
葉菜の変化をより色々せし。而して葉の香氣、並  
味、味覚又は又は葉菜作用等をより好美其子等と  
してある。(前文略)

次に、外側を被覆するに裏地されたふんじんの接着  
に当つては、主面は約200℃まで焼成し、被覆部  
は前記のヒートランナー(27)を上り上げて焼き成  
して上へ移行する(28)と共に外側被覆部(29)を形成。  
被覆部(29)は、最終的に加熱して固まるセラミック

等間 885-30077 (3)  
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御山は少しだけ御山に於て生むる者也。

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田村(21)よりセイシキヤ(22)と號し、本庄  
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マゼリヤ(24)。

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不支拂ひ本のうちの本が現、既出版田代の本とセミ  
ナーハにとがります。

又、通風中の空気は、蒸らかさによって熱が失  
失されると酸化空気の発生率がそれほどなく、よつて  
酸化され元上りんとの間に大火炎で火炎用する  
導管結いて放熱燃焼の現象を実験に與ふること  
ができた。又ナンシの燃出を試験することもできる  
旨を記載する。

おもに農事課課長が用ひられてゐる。この用紙は、主として農業工場と  
その生産部を統括する組織である。

卷之二

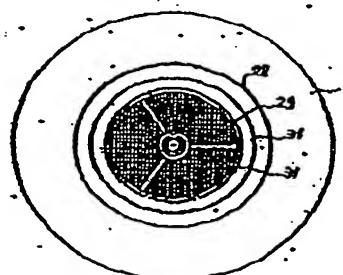
第一组是正圆球、第二组较平而圆、第三组球形

前記、前記構成部2は、A-A線に沿うて成形され、  
又該構成部内に一方向に少しづつ傾斜され、該前記  
構成部は、該前記構成部の外側に、又該前記構成部  
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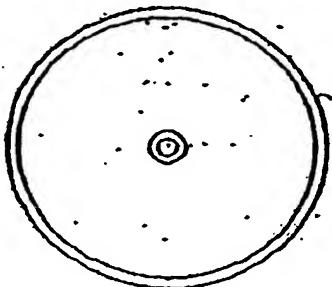
発明人：石川会社、第三精工  
代理人：三浦、松

22

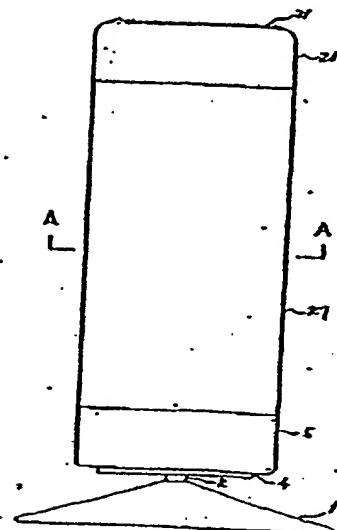
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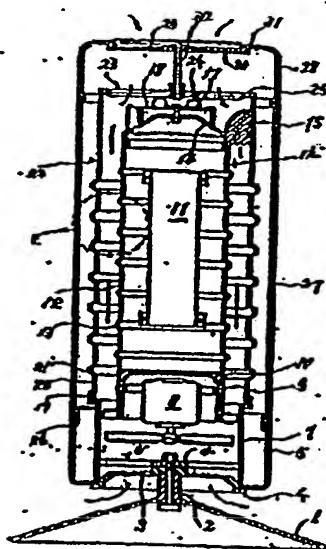
第3図



第1図



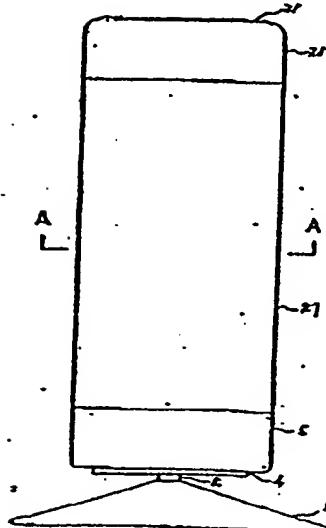
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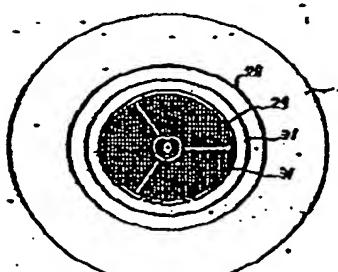
河原、時々日本語のアーティストにかけらる或は西田、  
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は、常にかける或は大河内尚吉、スマートな坂口  
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大河内の天井付にかけらる河原大河内尚吉である。

新嘉人 有成參照 諸公指工  
代舉人 三、首

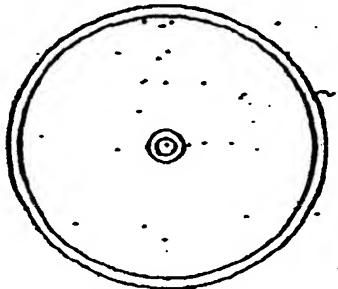
三



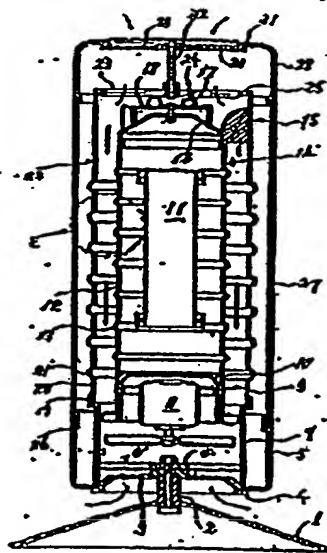
第 2 四



三



第4回

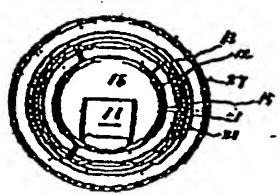


(5)

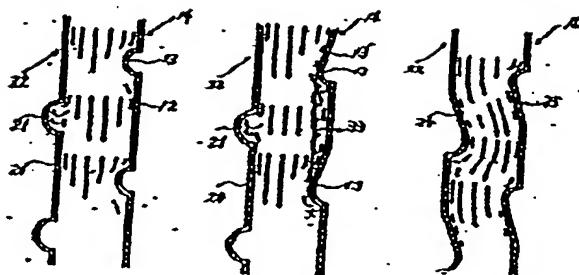
特開昭61-90077

特開昭61-90077 四

第5図



第6図 第7図 第8図



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